

MEMOIR
OF
BENJAMIN SILLIMAN, SR.
1779-1864.

BY
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BIOGRAPHICAL MEMOIR OF BENJAMIN SILLIMAN.

MR. PRESIDENT AND GENTLEMEN:—

IN performing the duty assigned me by the Academy—that of preparing a memoir of a venerable and lamented associate, Professor Silliman—I have found myself embarrassed on two accounts: First, for the want of that personal acquaintance without which it is difficult to apprehend correctly those habits of thought and traits of character which it is my purpose to develop; and secondly, from being called upon to appreciate scientific labors out of my own field of study, and where I am little familiar with the details of scientific progress, and therefore specially liable to err. I am quite aware how inadequate any sketch of his character from me must seem to those who knew him well. Under these circumstances the rectitude of my intention will perhaps shield me from the severity of criticism.

The facts and dates which I shall have occasion to use have been derived to a considerable extent from an article under the word "Silliman," in the "New American Cyclopædia," understood to be sanctioned by the intimate friends of our deceased associate, and from a commemorative discourse of President Woolsey, delivered in the Central Church in New Haven, November 28, 1864.

Benjamin Silliman was born on the 8th of August, 1779, in the town of Stratford (now Trumbull), in the State of Connecticut. He was the son of General Gold Selleck Silliman. The Silliman family is supposed to be of Swiss origin. From the early settlement of the country they had been residents of the neighboring town of Fairfield. In July, 1779, the British forces, under Governor Tryon, invaded the maritime towns in the vicinity, carrying consternation to the inhabitants, and conflagration and pillage to several of the towns and villages. The family of General Silliman sought refuge in the town of Strat-

ford, somewhat removed from the coast. And it was there, as before stated, that the subject of this memoir was born. It may be proper to add, that General Silliman graduated at Yale College in 1752, was a lawyer by profession, and an ardent patriot. During the Revolutionary struggle he rendered honorable service to his country, and evinced a devotion to the principles of liberty that might well become a descendant of the heroic and liberty-loving Swiss.

We have not at hand the means of tracing the childhood and early youth of young Silliman. At the age of eleven years he was bereft of his father, and was left to the fostering care and guidance of his mother. It is a sufficient indication of his diligence and aptitude in learning, that he was fitted to enter Yale College at the early age of thirteen years. His older and only brother, Gold Selleck Silliman, who still survives him, was a member of the same class. They both graduated in 1796.

We have now before us a young man of seventeen years of age, deeply imbued with religious sentiments, honorably distinguished as a student, and emulous of rivalling him who was foremost in the pursuit of good learning. To these advantages he united those of a fine physical constitution, and a kindly and pleasing address. With such "vantage-ground" to start from, we might confidently predict that, to whatever field of study he might turn his attention, his life would prove a success.

To talented and ambitious young men the profession of the law was then as now, and probably more then than now, the road to honor and fortune. Following in the footsteps of his father, young Silliman turned his attention to the study of the law. While prosecuting these studies, at an interval of three years from the time of his graduation, he received the appointment of Tutor in his Alma Mater. His last collegiate year was spent under the Presidency of Dr. Dwight, who no doubt saw in his youthful pupil those elements of character which fitted him for the duties of a college teacher. His name first appears on the catalogue as a tutor in 1799. He held the office for three years. In connection with his duties as tutor, he continued to prosecute the study of the law, and was admitted to the bar of New Haven in 1802. But another field of labor awaited him, for which no doubt the study of legal principles,

and especially the law of evidence, had given him a most valuable preparation.

Chemistry and Natural History had begun to attract the attention of educators. They had heretofore been regarded more as an adjunct to the medical profession than as a branch of general education. The science of Chemistry was then in its infancy. Its foundations had been laid, and it was destined to a rapid growth. Priestley had shown the existence and properties of Oxygen. The important doctrines of latent and specific heat had been discovered by Black. Cavendish had shown the existence of Hydrogen as a distinct fluid, and had succeeded in the decomposition of water. Lavoisier had demonstrated the chemical changes involved in combustion and evaporation. Dalton had explained the properties of vapors and gases, and especially had discovered the law of combination in definite proportions, and of chemical equivalents. Cuvier in the meridian of his glory was building up the great science of Comparative Anatomy, and connecting the animal structure of long ages past with that of the living present. Davy and Berzelius and Gay Lussac were just entering on their several careers of discovery, which have rendered their names illustrious in the history of science. The science of Geology, as now understood, had then no existence.

With these facts before him, President Dwight saw the importance of making Chemistry and the natural sciences a part of general education. He discerned in his young friend those endowments and aptitudes of mind which promised success in these departments of science. He accordingly, in 1802, urged upon Mr. Silliman the expediency of abandoning the profession of the law, and of devoting himself to science. The suggestion was adopted, and the corporation of Yale College in that year elected "Benjamin Silliman, Esq., as the Professor of Chemistry and Natural History." It is our impression that there were at that time only two of our collegiate institutions where instruction was given in Chemistry—those of Harvard College and the University of Pennsylvania.

Professor Silliman did not immediately enter upon the duties of his new office. He took time for preparation. Portions of two winters were spent in Philadelphia, as a student of Dr. Woodhouse, prosecuting his professional studies under advan-

tages which probably no other American city could then furnish. Dr. Hare had at that time just invented and brought into use the Oxyhydrogen or Compound Blowpipe, which generated an intensity of heat hitherto unknown to the Laboratory, and gave to science a new and efficient means of research. It was fortunate for both, perhaps, that Professor Silliman was engaged with him in many experiments with this instrument. His first course of lectures was given in the winter of 1804, and repeated in 1805. With a view more fully to prepare himself for the duties of his professorship, he determined to avail himself of the advantages of foreign schools of science, and accordingly sailed for Europe in the spring of 1805. He remained abroad somewhat more than a year, attending lectures in London and Edinburgh, and devoting a portion of his time to travelling. In 1810 he published an account of his travels, entitled "Journal of Travels in England, Holland, and Scotland in 1805-06," in 2 vols. 8vo., which, in a subsequent edition, was printed in 3 vols. 12mo. This work is replete with useful and interesting matter, reflecting in an easy, perspicuous style the impressions of a diligent observer of men and things. It was widely circulated, and gave to the author an agreeable introduction to the reading public.

During this residence abroad he had the opportunity of becoming acquainted with many of the foremost scientific men of that period. Among others he mentions Dugald Stewart, Professors Hope, Murray, Playfair, Jamieson, and Seymour. In the preface to his Treatise on Chemistry, he acknowledges special obligations to his former teachers, Professors Murray and Hope of Edinburgh. Nor did he fail—as who would?—to embrace the opportunity of listening, in the House of Commons, to the eloquence of Pitt and Fox, Sheridan and Windham.

On his return from Europe, in 1806, Professor Silliman resumed the duties of his professorship, embracing chemistry, pharmaceutics, mineralogy, and geology, which he continued to discharge with ability and rare popularity for a full half-century. He did not during this entire period have under his charge all these subjects, but it was only in 1855 that he relinquished his post as a college teacher. Very few men in any department can show a scientific career so laborious and so long continued.

Of the results of the instructions given to his college classes,

I shall speak further on. But I may here say, that it was not the habit of his mind to confine himself to any single inquiry, or to any narrow routine of study. Whatever of scientific interest presented itself in any direction was sure to attract his attention. Though not to be placed in the list of great discoverers, he was among the earliest, in the progress of chemical science, to verify the discoveries of others, and so to illustrate and incorporate them in the body of science as to make them accessible to his pupil. The discovery of new truths is restricted to the fortunate few; the diffusion of them belongs to the practical, diligent many. A brilliant reputation crowns the former; comprehensive usefulness is the reward of the latter. Professor Silliman, pursuant to the practical bent of his mind, appears to have made the diffusion of knowledge his chosen field of labor. He never lost sight of the general interest and public utility of science, yet this characteristic of his mind did not prevent him from prosecuting at times laborious original researches. In 1811 he instituted an extended course of experiments with Hare's blow-pipe, in which he succeeded, as he tells us, in melting lime, magnesia, rock-crystal, gun-flint, corundum gems, and a long list of the most refractory minerals, "the greater part of which," he adds, "had never been melted before."¹ A detailed account of these experiments was published in the Transactions of the Connecticut Academy of Arts and Sciences, in 1812.

On receiving intelligence of Sir Humphry Davy's discovery of the metallic bases of the alkalis, he immediately repeated his experiments, and "obtained, probably for the first time in the United States, the metals potassium and sodium."² While conducting some experiments with a powerful Hare's Galvanic Deflagrator, in 1811, he observed that the charcoal "point of the *positive pole*" instantly "shot out" towards the *negative pole*. And on further examination he found that there was a corresponding cavity on the point of the negative pole. He hence inferred that there was an *actual transfer* of the matter of the charcoal points from one to the other. He further found, on careful examination, that the charcoal *was fused*. An account of this interesting discovery is given in the fifth volume of the Journal of Science. It is claimed for Professor Silliman that

¹ Journal of Science, vol. i. p. 99.

² Am. Cyc., § Silliman.

he was the first to establish *this transfer* of the *particles of carbon*, and the first also to *fuse carbon* in the voltaic arch.

Professor Silliman early felt the necessity of having some medium of communication between the cultivators of Physical Science and Natural History in different parts of the country. He saw how much science abroad was indebted to such journals as "Thompson's Annals of Philosophy" in England, and the "Annales de Chimie et de Physique" in France. He resolved on establishing a similar journal in this country, which should present to the public at brief intervals the results of scientific research, and by that means accomplish the two objects of diffusing information and stimulating inquiry. He accordingly, with pledges of assistance from a respectable corps of contributors, commenced the publication of the "American Journal of Science," more popularly known as "Silliman's Journal." The first number bears the date of 1819. For twenty years he was the sole editor, and the senior editor for eight years longer. He continued it under many embarrassments, and with far less patronage than its merits deserved. For a long time his own labors, which were never small, may almost be said to have been gratuitous; and not unfrequently the expense of bringing out the numbers became a charge upon his private funds, at least till generous friends came to his relief. Whatever this journal has done for American Science at home and abroad, and how much it has done every one knows, it was the creation of Professor Silliman. Under the management of a man of less energy, less confidence of hope, less devotion to the interests of science, less practical tact and administrative ability, the American Journal of Science would probably be remembered only as a premature and unsuccessful attempt to follow in the footsteps of older and more scientific nations.

Professor Silliman wielded a prolific pen. In 1820 he published, in a duodecimo volume, the incidents and observations of a journey from Hartford to Quebec. This journey was performed by slow and easy stages, and the volume abounds in pleasant descriptions of the different towns through which he travelled, with historical reminiscences and notices of geological formations.

In 1829 he edited an edition of Bakewell's Geology, and added, in an appendix, a copious compend of his own course of lectures

to his college classes. In this compend the author presents a clear and simple statement of the facts and principles of the science as they were then understood, basing his arrangements, as he remarks, "upon the great outlines of the Wernerian plan." Without following any one as an authoritative guide, he evidently accords to Werner a degree of merit which later writers, as I apprehend, have not found reason to bestow. He says, in his preface, "It has become fashionable to decry Werner; but, without being his blind admirer, I may be permitted to ask, Who has done more for Geology, and who has done it better?"

In the controversy so long and so fiercely maintained respecting the Mosaic account of the Creation, he gave his decided support to the defenders of Scripture. He saw no necessary discrepancy on that subject between the teachings of science and the teachings of revelation. "The writer," he remarks in his preface, "after studying the subject for many years, has formed the opinion that the geological facts are not only not inconsistent with sacred history, but that their tendency is to illustrate and confirm it." With respect to the Mosaic account of the *Deluge*, he expresses himself even more strongly. "Geology," he says, "fully confirms the Scripture history of that event."

In 1830 he published an elaborate treatise on General Chemistry, in two volumes, octavo, entitled "Elements of Chemistry, in the order of the Lectures given in Yale College." It lays no claim to originality in the treatment of the subject. From the results of his own laboratory, and from his much reading, he gathered up all the known facts and laws of the science, and embodied them in a form which he deemed most convenient for instruction. His object, as expressed in his own language, was "to unite copiousness with condensation, perspicuity with brevity, and a lucid order and due connection of subordinate parts with a general unity of design." The work was, we believe, well received by the scientific public, and somewhat extensively used for the purpose of elementary instruction. In the judgment of a contemporary journal entitled to high consideration, "it was a work that was needed," and that was "eminently adapted to the objects for which it was prepared."

In 1851 Professor Silliman made a second visit to Europe. Forty-five years had wrought great changes in the scientific circles familiar to his first visit. Many whom he had once known

were no more. He had the happiness, however, of personally meeting many others whom he had long known as scientific correspondents. The account of this visit was given to the public in three volumes, duodecimo, in 1853. It was a work well stored with careful observations and interesting narratives, thus recalling many agreeable reminiscences in the minds of those who have visited the same scenes, and communicating much useful information to those who have not. To show the public appreciation of this work, we may remark that, while new works of the same general description have been constantly teeming from the press, this has already passed through six editions.

I have thus briefly referred to the published works of Professor Silliman. But these do not, by any means, comprise the whole of his scientific labors. His special field was the diffusion of science; and his special gifts and acquirements made him one of the most popular scientific lecturers in the country. His commanding presence, his urbanity of address, his wealth of knowledge, his ready and graceful elocution, were all fitted to win the public favor, and secure for him a large and delighted audience wherever it was his pleasure to speak. Without being profound or original, he selected from the great storehouse of knowledge, all familiar to him, so judiciously, and threw such an enchantment around his theme, that all felt a kindling of enthusiasm as they listened. They drank in the doctrines of latent heat and chemical equivalents, saw through all the forms and laws of crystallization, and could plainly read in minerals, and fossils, and rocks of the fields, the geologic eras which stretch back into the immeasurable past, where no human eye ever saw. It was the power of personal inspiration that seemed to quicken their intellects.

Between the years 1834 and 1845, Professor Silliman delivered courses of scientific lectures in nearly all the large cities of the country, ranging from Boston to New Orleans. He gave four courses before the Lowell Institute in Boston, "Treated everywhere," says President Woolsey, in speaking of these lectures,— "treated everywhere with the highest consideration, welcomed by the numerous sons of Yale dispersed through this broad land, he had almost a triumphal progress, and widely diffused, it is believed, a taste for physical science."

Such is a brief summary of the scientific labors of our deceased associate. I can recall but few men who have labored so long,

and done so much. But my task would be incomplete without some additional remarks illustrative of his character and services.

In the general retrospect of his life, one cannot but be struck with the amount of labor which he performed. The superintendence of his journal, preparing its articles, carrying on its large domestic and foreign correspondence, and looking after its insufficient finances, was itself no easy task. But to this he added almost daily lectures to his classes, often requiring much preparation, and yet found time to prepare books of instruction, and lectures for the public.

It seems to me that the *utility of science*, in its broadest sense, was always uppermost in his mind. He is always tracing abstract principles to their practical applications. In his several books and papers, he aims at the accomplishment of useful ends. His style of writing looks to this. It is direct, simple, perspicuous. Its only object seems to be to expound clearly the subject under consideration. It is business-like. It reads as if the author had too many important matters on his hands to occupy himself in the mere refinements of style.

We have already referred to the distinction between the discoverer of new truths and him who diffuses them abroad and gives to them their practical applications. The former is testing the powers of nature by the crucible and the balance and all those reagents which bring into play the affinities of matter; the latter is acting upon the intellectual powers of the community, and putting in motion far and wide over the land those mental agencies which result in wider general knowledge, higher culture, sounder practical judgments, and more productive industry. It is sometimes difficult to say which of these two classes of laborers confers the largest benefits upon the world. Nor, indeed, need we attempt to decide upon their respective merits. It is sufficient that they are both necessary to the highest ends of science. It was the fortune of our friend to act, for the most part, as the diffuser of knowledge. And by what criterion shall we estimate the obligations which we owe to him in this respect?

It was said of Dr. Black, by a very competent judge¹ of his scientific merit, that "his influence on science was chiefly exerted through the medium of his pupils and of his intercourse with

¹ Prof. J. D. Forbes, *Encyc. Brit.*, 6th Dissertation, p. 927.

general society." With equal truth may this be said of Professor Silliman, and especially when we consider the vast extent of his field of instruction. Among the pupils of half a century how many have caught the enthusiasm of the master and given their energies to science, and placed their names high on the list of its honored cultivators! How many hundreds and thousands of those who, in different cities, have listened to his eloquent lectures, have learned to appreciate science, and gather refined pleasure from its culture, and give to it their hearty patronage! How regularly and how widely has his Journal carried to the reading public intelligence of the latest discoveries, and the best practical applications of science!

Considering all this, who shall say that his efficient influence has not been felt in every institution of learning, in every profession, nay, in every workshop, and every cultivated field in this broad land of ours!

It is undoubtedly true, as has been stated by one of his accomplished colleagues, that "his mind was of the rhetorical, not of the analytical cast." He seldom expended his energies in attempting to unravel the dark and tangled web of science. Profound, original thought was not the productive element of his mind. He followed in the footsteps of the explorer, and quickly gathered up whatever was valuable in the way, and sent it forth on its mission of utility. In view, then, of what he has done for Chemistry, for Mineralogy, for Geology, and for the general diffusion of knowledge, we may well say that the name of Silliman will ever be an honored name in the annals of American Science.

Thus much we think may be justly and pertinently said of the scientific career of Professor Silliman. But he was more than a scientist: he was a *citizen*, a *patriot*, and a *Christian*.

As a *citizen* we believe he was universally honored and beloved. He was in every good work. His kindly interest in those about him, his uniform urbanity, his readiness to oblige, made friends of all who had the opportunity of knowing him. It will not be too much to say that his fellow-citizens by common consent regarded him as their first citizen. He was their representative man. His presence added dignity to every assembly. His counsels were listened to as words of patriarchal wisdom and authority.

As a *patriot* it is well known how ardent he was in the defence

of the Constitution and the laws, when they were imperilled by the machinations of disloyal men. When the conflict arose between slavery and freedom in Kansas, he threw the whole weight of his influence into the scale of freedom. He saw clearly that the ambitious designs of the slave power must be strenuously opposed and defeated at that point. He was satisfied, as many others were, that lukewarmness or indifference then might be fatal to the interests of freedom throughout the republic for generations to come. That was one of the turning-points in our national destiny. A profound regard for justice and the rights of humanity and the honor of the nation urged him to do everything in his power to prevent the further extension of slavery in the Territories.

When the purposes of the slave power culminated in armed secession, there was but one course before him. It was to sustain the government and put down the rebellion by every means in the power of a great and free people. In the disruption of the government, and the establishment upon our borders of a political power based on human slavery as its "chief corner-stone," he saw nothing but national humiliation, disaster, and ruin. His country, entire and undivided, its Constitution and equal laws securing freedom and protection alike to all; these were the objects of his profound regard. And higher objects than these the loftiest patriotism has, perhaps, never achieved.

I have yet to speak of our associate as a *Christian*. Without this, all that I have said and all that could be said would leave his real character unfinished; nay, almost distorted and deformed. Early in life he became convinced of the truth of revealed religion and of his personal duty in response to its mandates. He made a public profession of his faith in Christ while a tutor in college, and became a member of the College Church. For more than threescore years, in all the relations of life, he exemplified the virtue of the Christian character. At the time of his death he was, with one exception, the oldest member of the College Church. If I may judge from the testimony of others, the lustre of his Christian character grew brighter and brighter as he drew towards the end of his pilgrimage. The contemplation of nature, no less than the sublime teachings of Scripture, inspired him with true devotion. His death was but the beautiful termination of a conscientious religious life. With physical powers far less

impaired than is usual to his age, and with mental powers still fresh and active, he died in the bosom of his family almost without warning, and without pain, on the morning of Thanksgiving day, November 24, 1864, in the eighty-sixth year of his age. He had just closed his accustomed service of prayer and praise, with a heart full of gratitude to God for the blessings bestowed upon him, he was uttering words of endearment and affection to members of his family when the summons came, and he was numbered with the dead. In contemplating a scene so touching, who can refrain from exclaiming, in the language of Scripture, "Let me die the death of the righteous, and let my last end be like his"?

Professor Silliman was twice married. He was most happy in his domestic life, and in the children and grandchildren who will delight to honor his memory, and bear onward the torch of science which he has laid down.